California Water Plan Update 2013
Groundwater Caucus – November 2011

Groundwater Content Enhancement

Deliverable #4:

Estimating Change in Groundwater Storage using Groundwater Level Data

Task 4 - Introduction

- Task 4 Deliverables – Status
- Change in GW Storage GIS tool – Overview
- Change in GW Storage Reporting Examples
- Questions and Challenges

Task 4 - Deliverables

- Status of Task 4 Deliverables
  - 4.1 - A technical memorandum describing the GIS model
  - 4.2 - Annual Spring GW level data, 2006 - 2010
  - 4.3 - Estimated yearly change in GW storage, 2006 – 2010
  - 4.4 - Report change in GW storage results

Task 4 – Change in GW Storage GIS Tool

- Task 4 delivers estimated **change in GW storage** as determined from **seasonal groundwater level data**
- The method used to estimate change in GW storage must be **transparent**, **repeatable** and **reliable**
- The **GIS modeling tool** automates the processing of a large data set

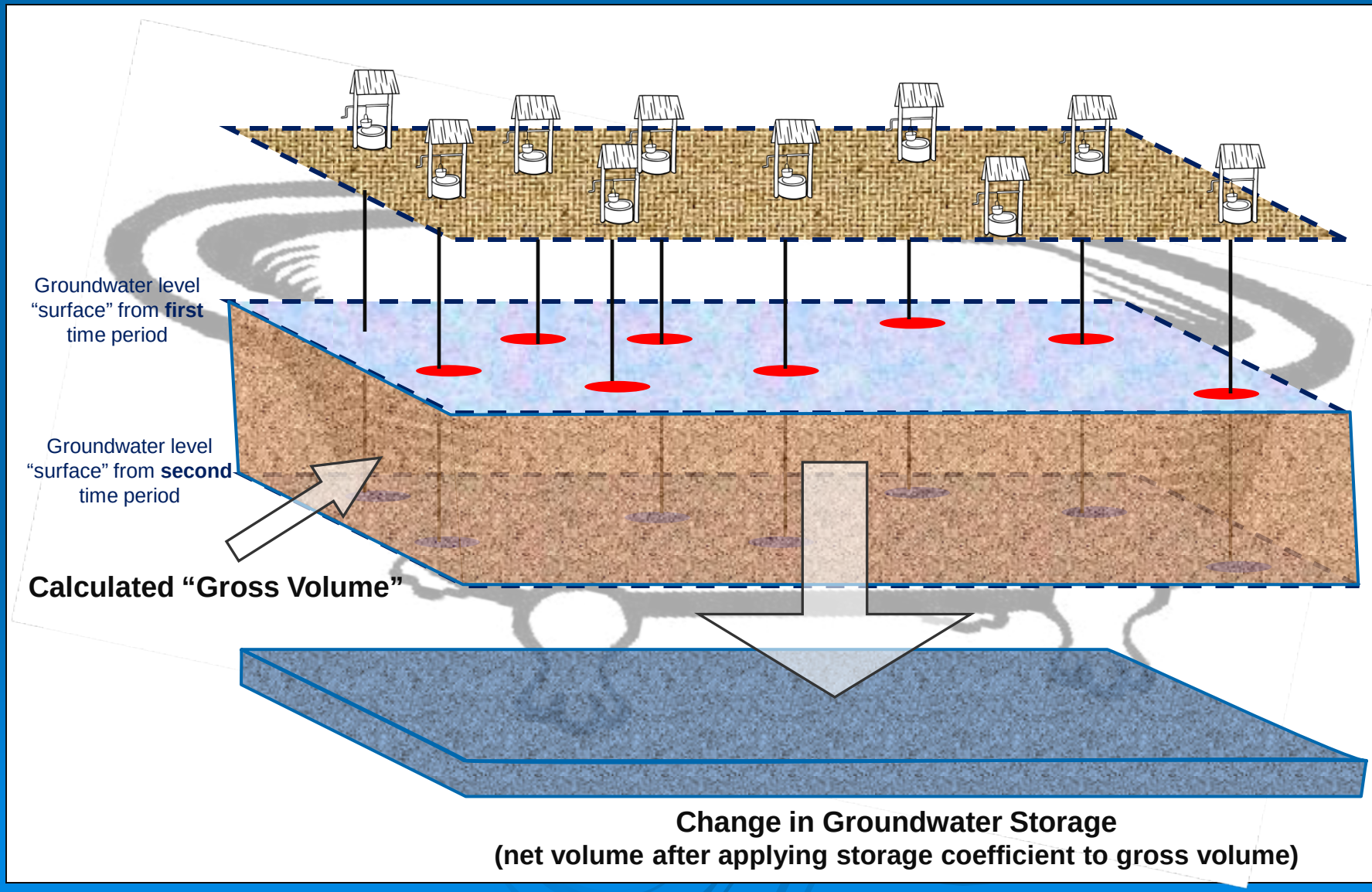
Task 4 – Change in GW Storage GIS Tool

- Changes in annual GW storage are based on comparisons of Spring season GW level data collected from two consecutive years
- Water levels represent unconfined to semi-confined conditions
- The GIS tool requires that WL data reside in a single database (the DWR Water Data Library)
- Specialized GIS tools query and plot the data using a map based interface

Task 4 - Terminology

- Groundwater Storage
  - The quantity of water in the saturated zone (of an aquifer)
  - aka. “Groundwater in Storage”
- Change in Groundwater Storage
  - The calculated difference in groundwater storage from one time period to another (“early” and “late” periods)
  - Not directly measureable
- The GIS tool does not calculate total groundwater storage

Task 4 – Change in GW Storage GIS Tool



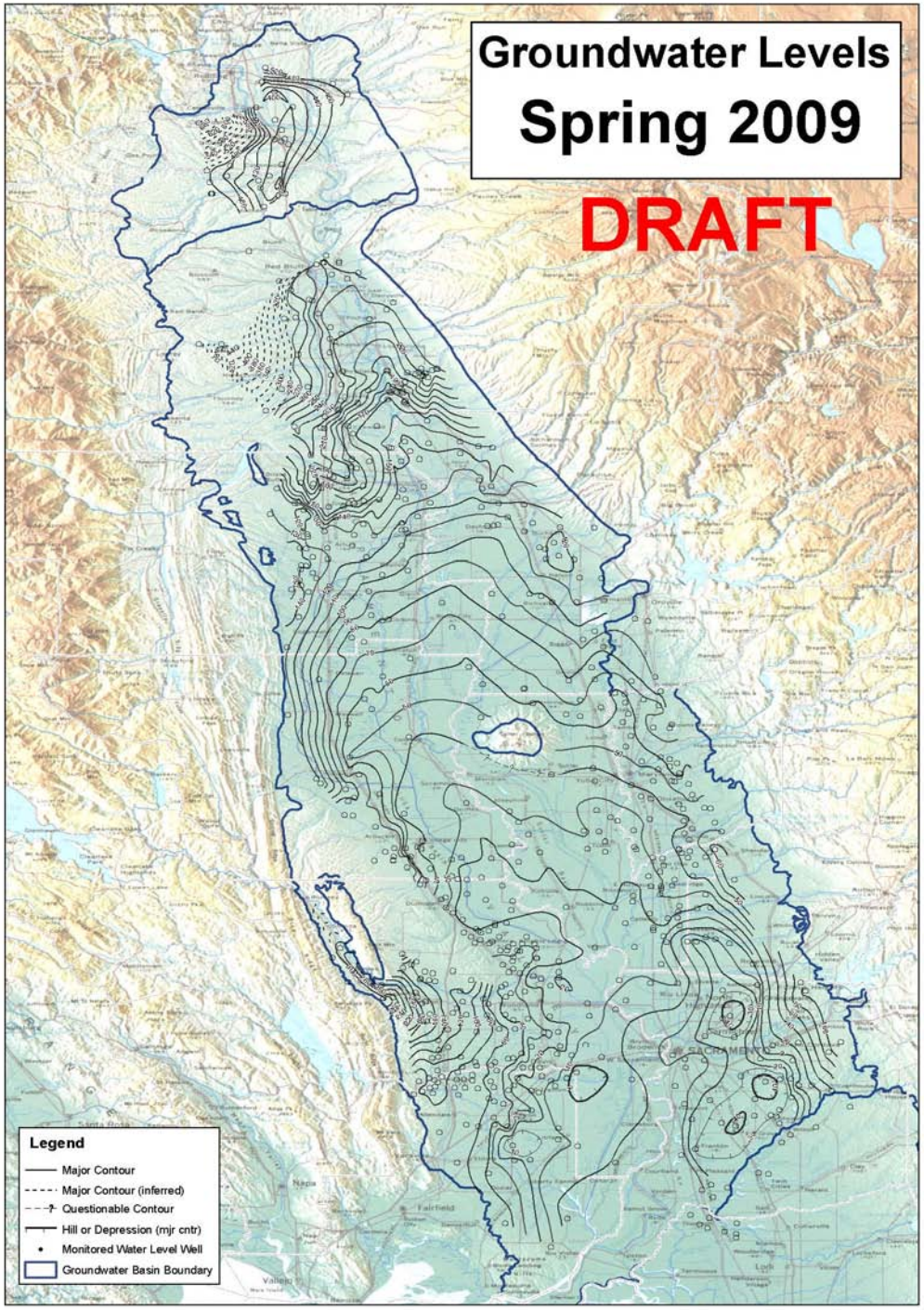
Task 4 – Example Reports

Reports of seasonal (Spring) groundwater elevations

- Terminology
  - **Spring** – the time period when groundwater levels are highest
  - **Groundwater elevation** – the water level measured in a well that intersects an unconfined aquifer, represented as feet above or below mean sea level

Seasonal Data:

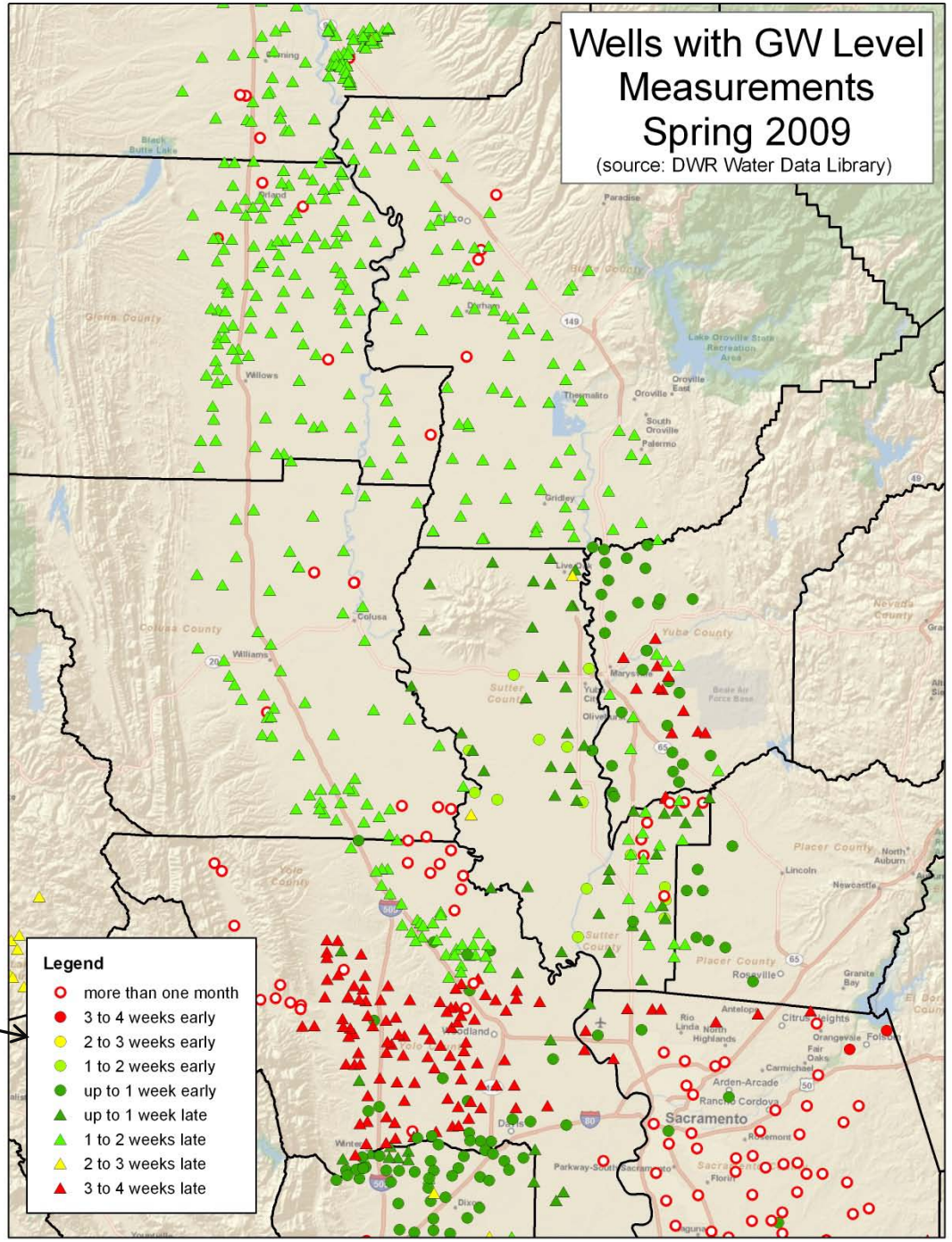
GW Level Contour Map
representing
GW elevation surface
Spring 2009



PRELIMINARY DATA

Seasonal Data:

GW Level Measurements
Point Data
Spring 2009



Well symbols indicate the time gap between the measurement date and a target date of March 15th.

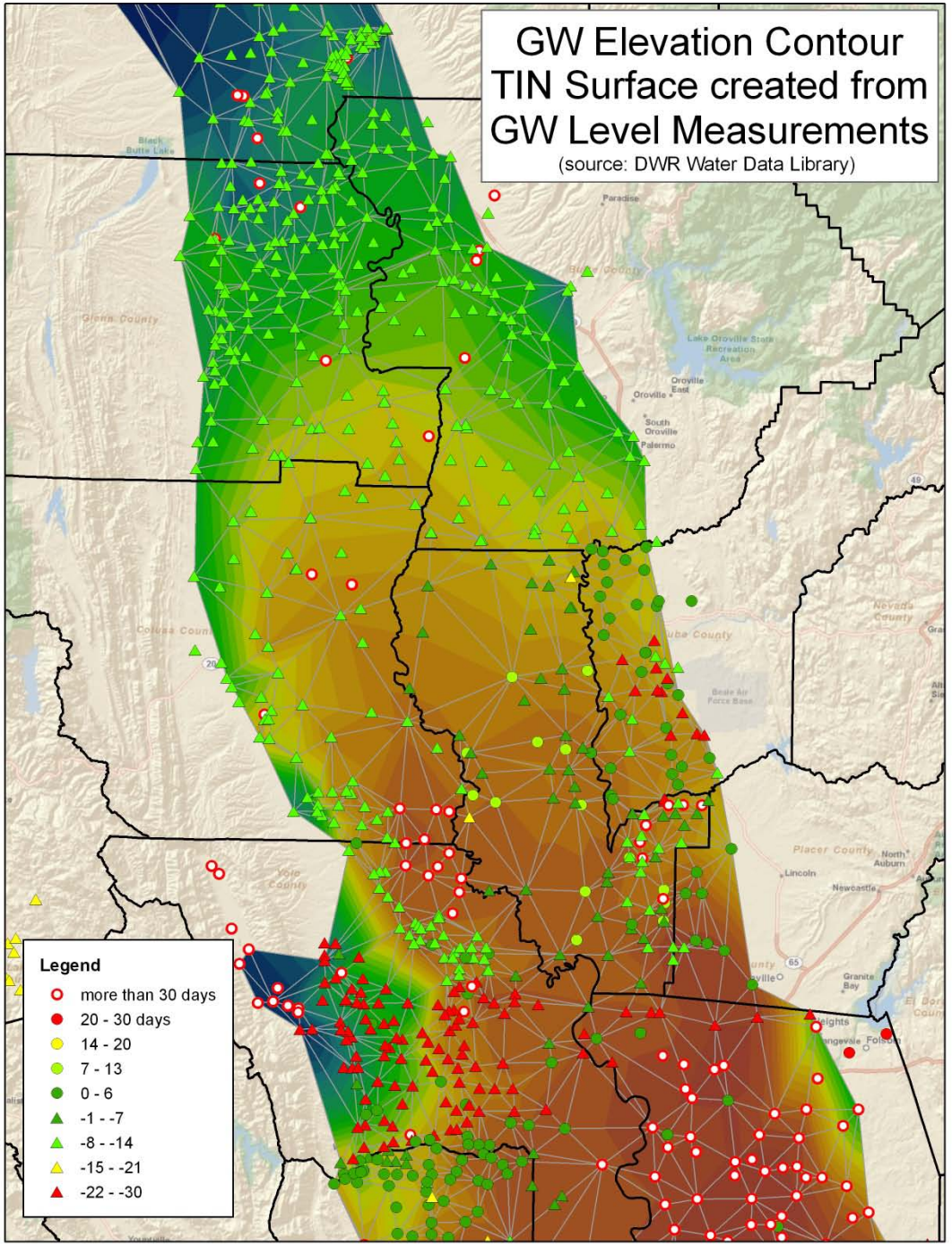
PRELIMINARY DATA

Seasonal Data:

GW Level Elevation Surface TIN created from Point Data Spring 2009

Spikes or holes in the surface may indicate questionable data.

PRELIMINARY DATA



Seasonal Data:

GW Level Contour Map
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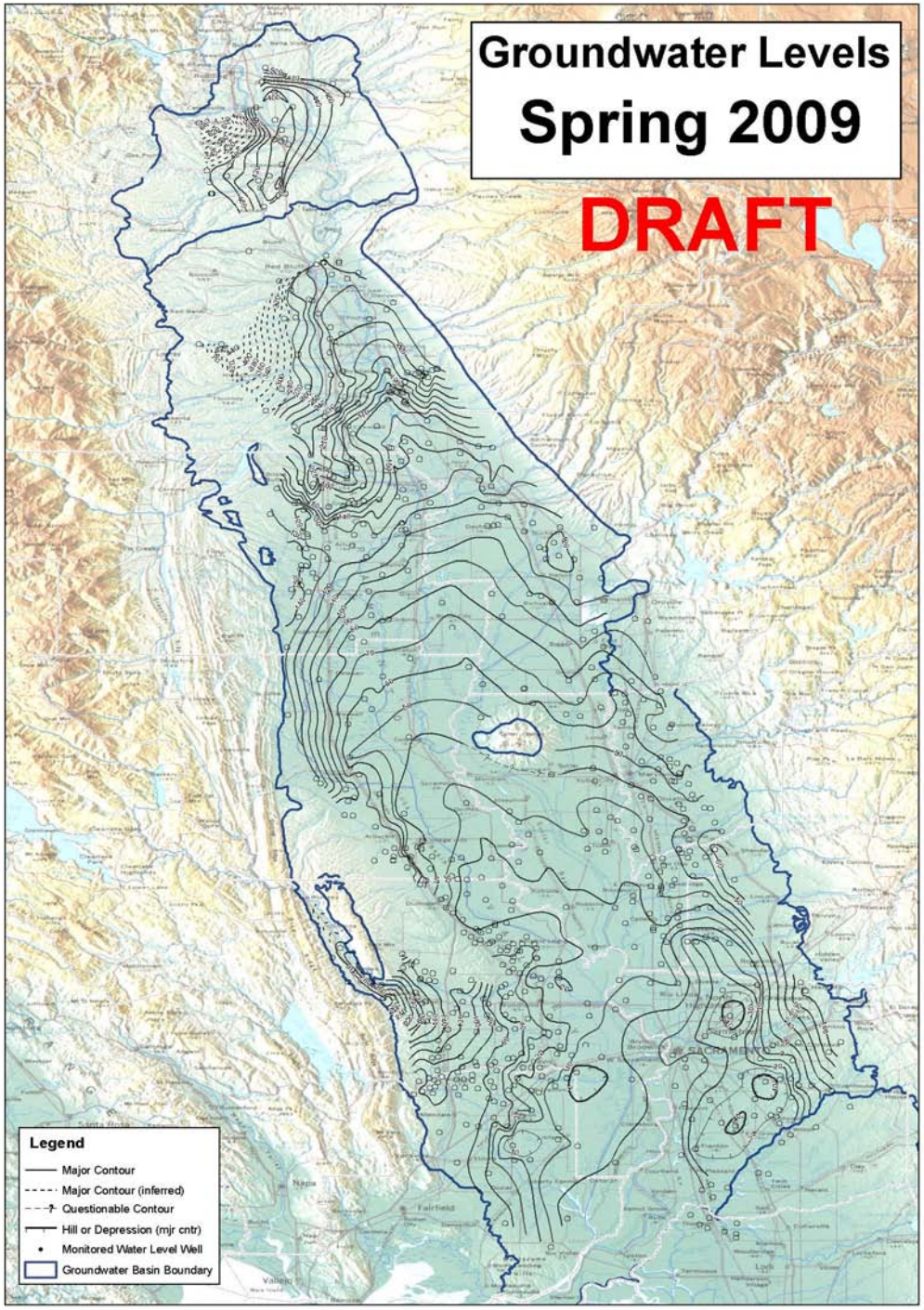


PRELIMINARY DATA

Task 4 – Example Reports (cont.)

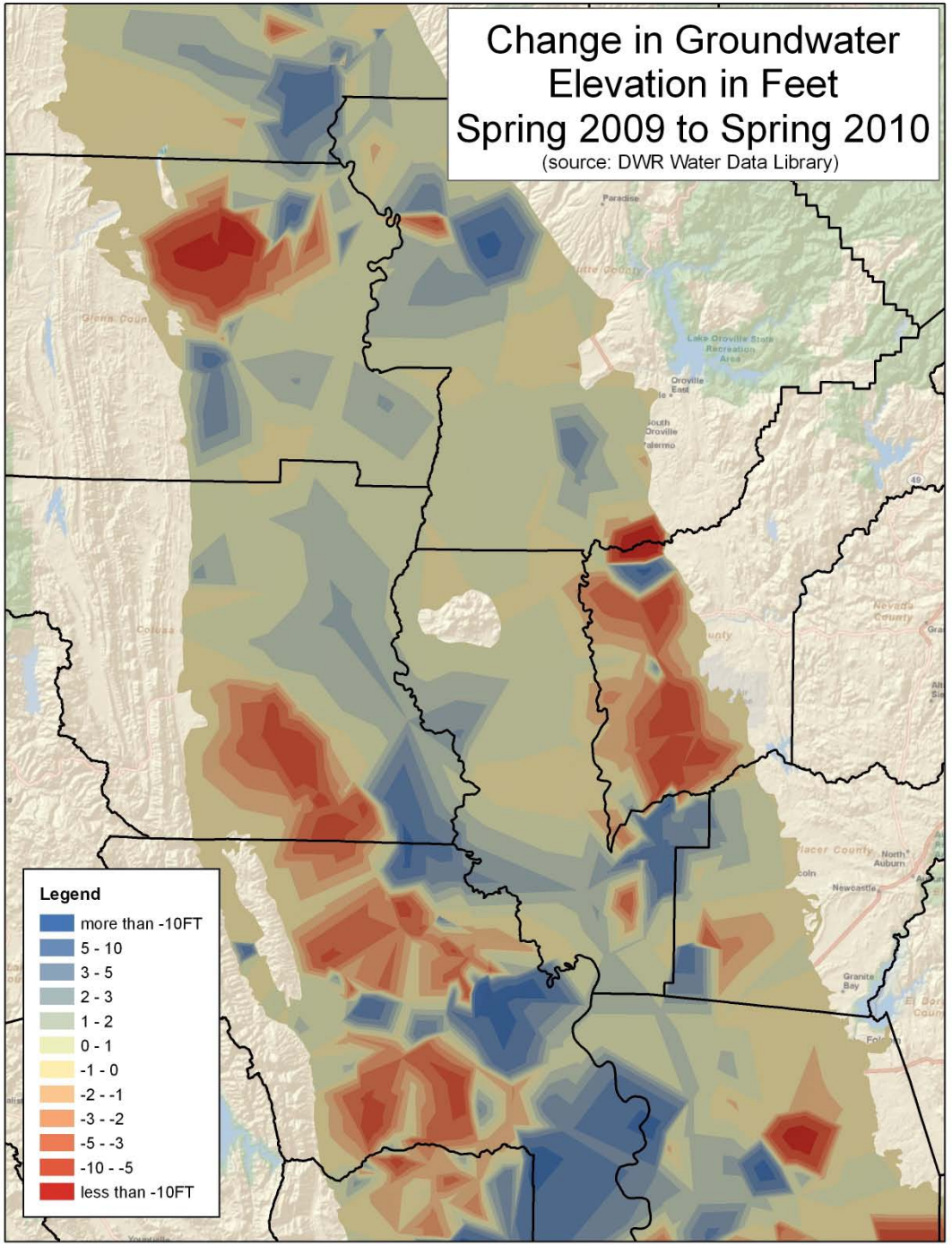
Reports showing Change in Groundwater Elevation and Change in Groundwater Storage

- Terminology
  - Basin – a user defined region used for calculation and reporting purposes
  - Gross Volume – the total volume between two groundwater elevation surfaces within a basin
  - Storage Coefficient – the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head

Estimated Change Reporting:

Change in GW Elevation Measured in Feet Spring 2009 to Spring 2010

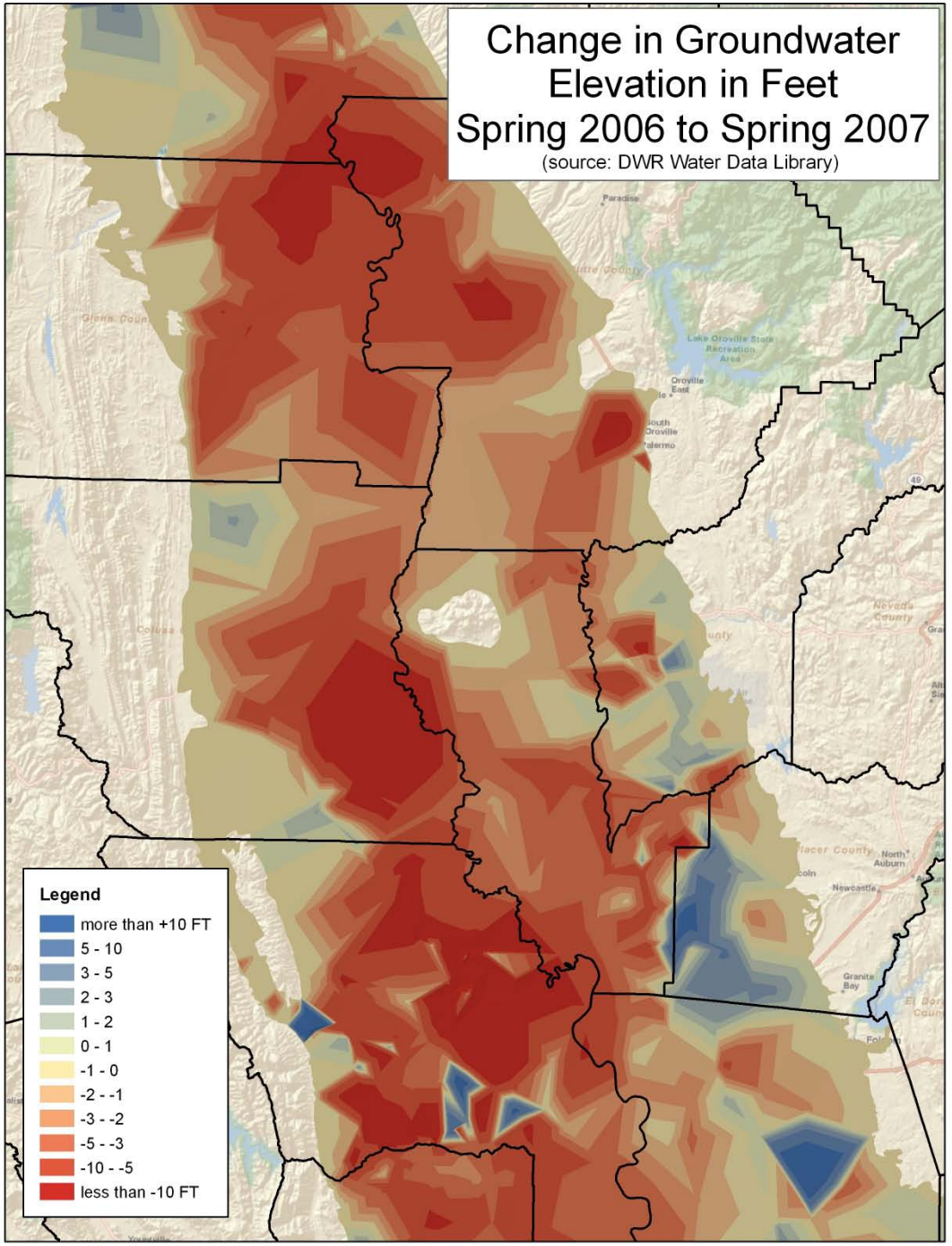
PRELIMINARY DATA



Estimated Change Reporting:

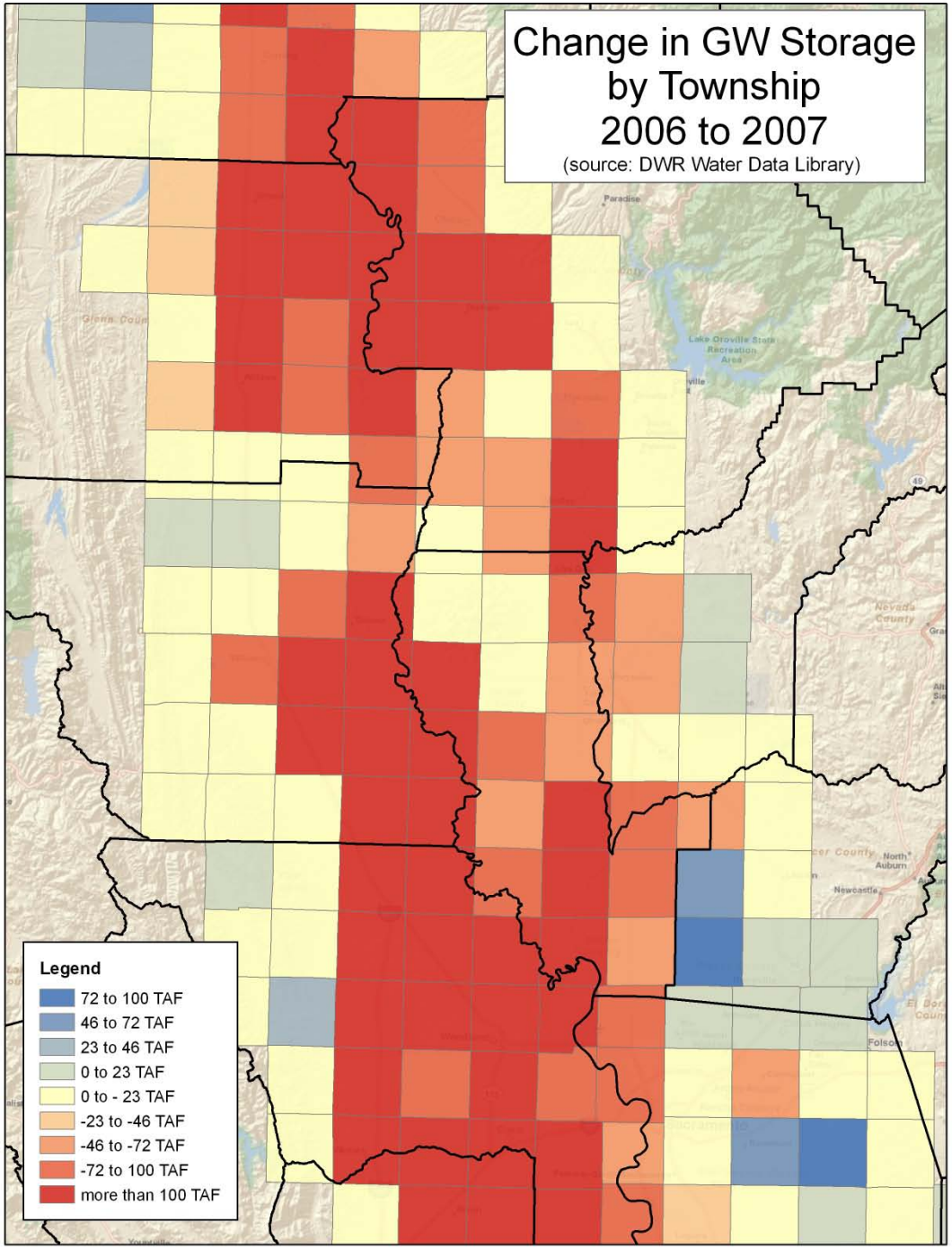
Change in GW Elevation Measured in Feet Spring 2006 to Spring 2007

PRELIMINARY DATA



Estimated Change Reporting:

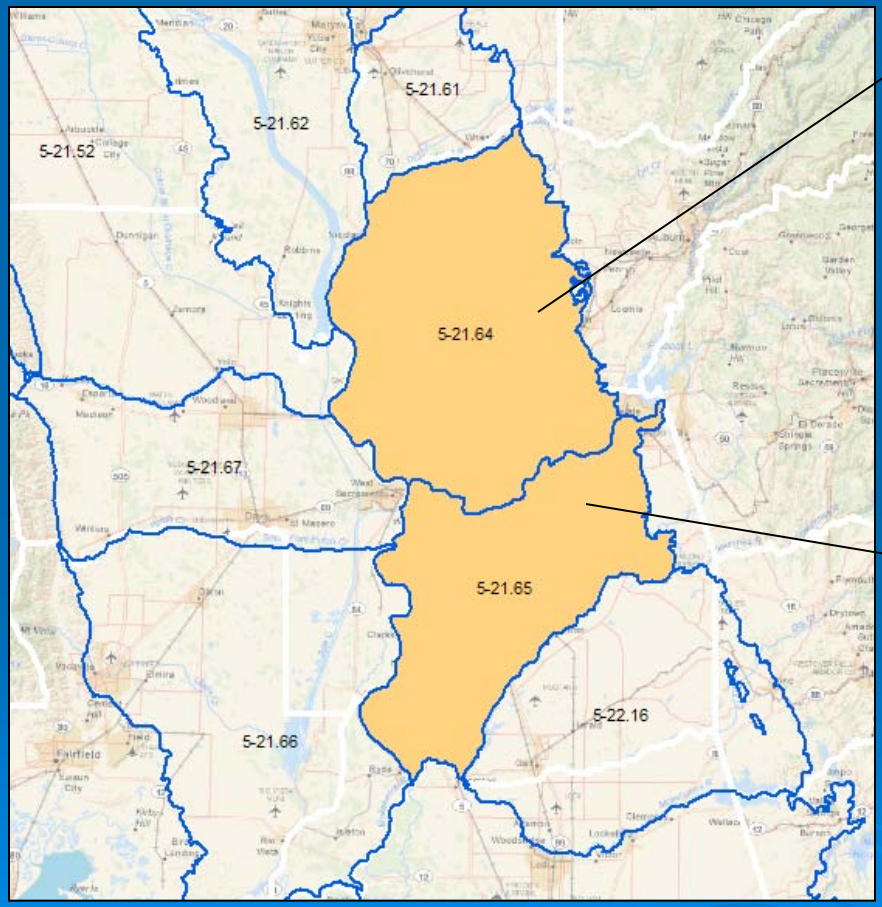
Change in GW Storage
Spring 2006 to Spring 2007

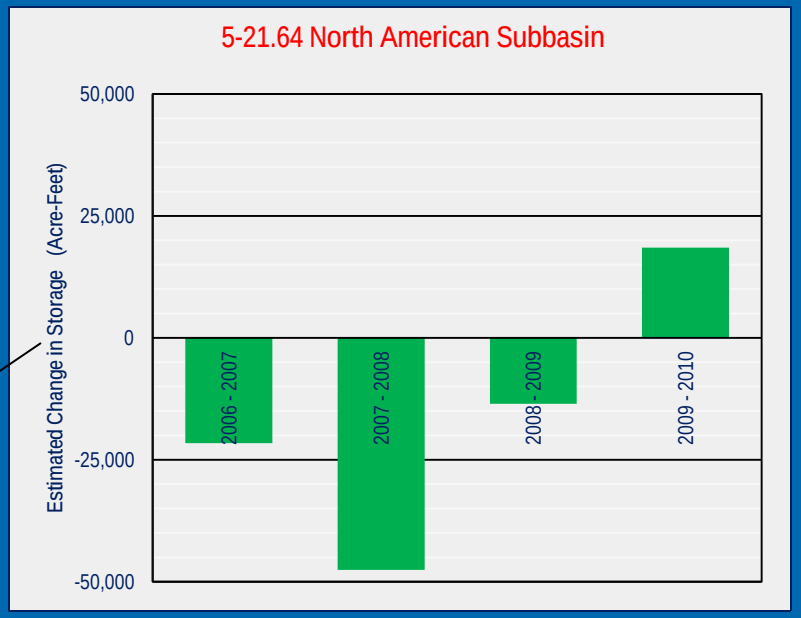


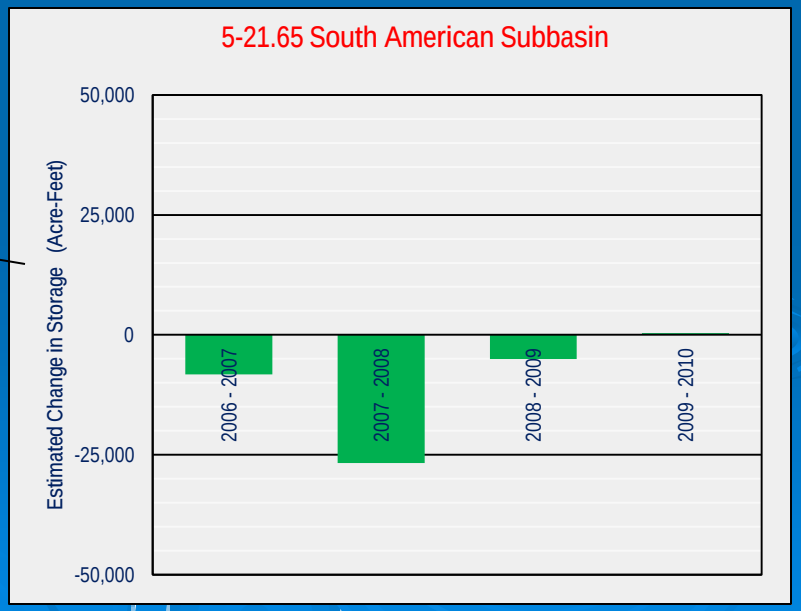
PRELIMINARY DATA

Change in GW Storage Reports:

Estimated Change in GW Storage For selected GW subbasins in the Sacramento Valley 2006 – 2010







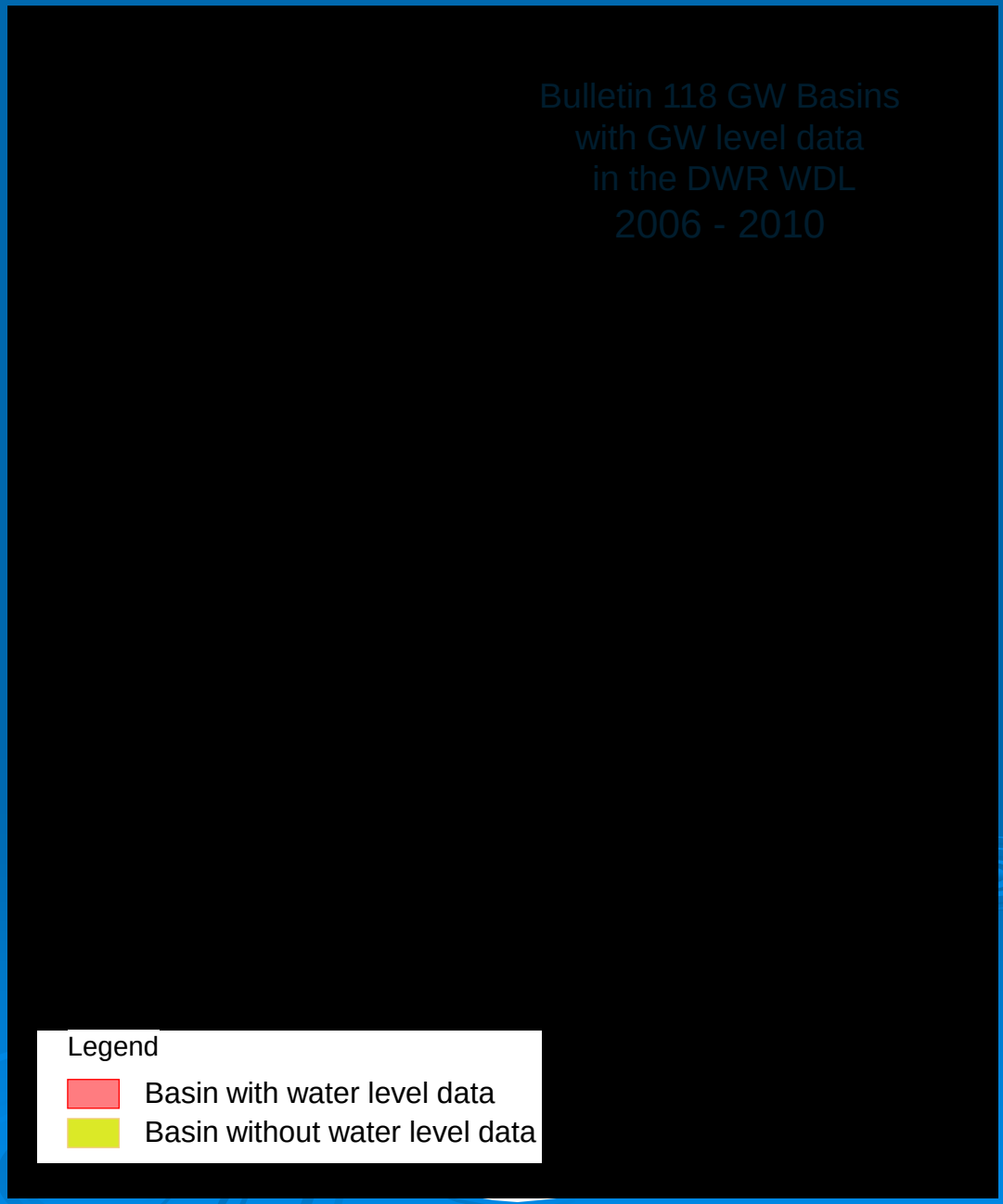
PRELIMINARY DATA


1 1 1997

Task 4 – Challenges and Questions

- Data availability
  - Spatial / Temporal data is required
    - Well data / Hydrogeology data / Water level data

- Real and apparent gaps exist in our currently available dataset

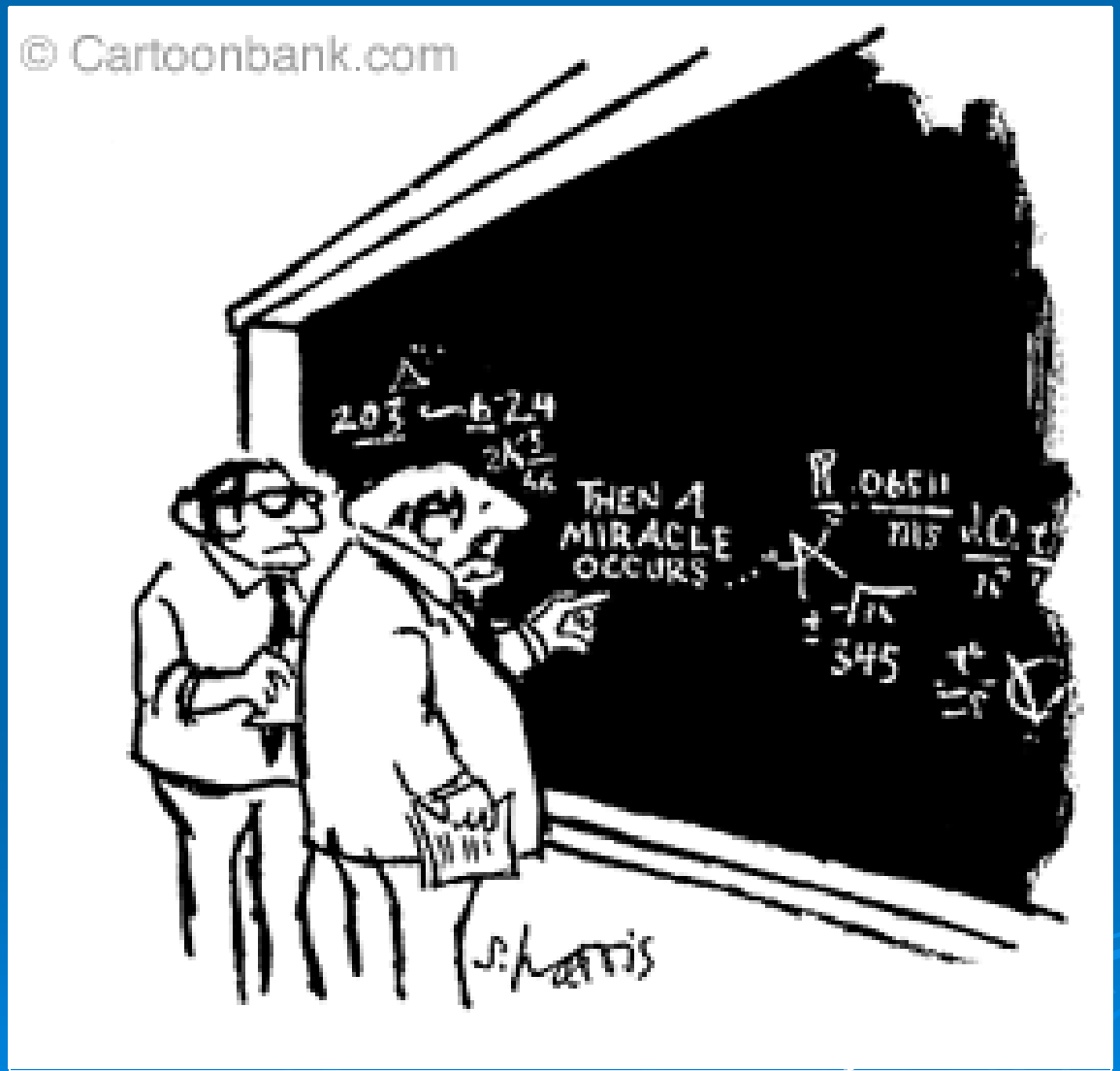


Task 4 – Challenges and Questions

- Data availability
  - Spatial / Temporal data is required
    - Well data / Hydrogeology data / Water level data
- Validation of results
- Consideration of other methods used to estimate change in GW storage

Task 4 – Challenges and Questions

- Data availability
  - How should real and perceived data gaps be addressed?
- Validation of results
  - What are your suggestions for confirming that the estimates are correct?
- Local and Regional models
  - What are your suggestions for using local and regional GW models and other GW reports to supplement these estimates?



"I think you should be more explicit here"